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Making agrobiodiversity work: results of an on-line stakeholder dialogue (OSD) in the Netherlands

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Abstract

An analysis is made of the perception of 'agrobiodiversity' by 45 individuals being directly or indirectly involved in the Dutch agro-food chain. The analysis is based on an on-line stakeholder dialogue (OSD) entitled 'Vision on Agrobiodiversity' and 25 personal interviews. The OSD was held between October 1999 and May 2000 and generated 105 contributions. It was initiated to investigate the limited attention for and fragmented perception of agrobiodiversity. In the process we were confronted with basic causes for these attitudes. This study first considers the advantages of an OSD over traditional forms of professional dialogue, such as conferences and working groups. The results of the OSD lead us to the observation that Dutch policy-making on agrobiodiversity has been mainly motivated by international obligations and has involved a very limited number of stakeholders nationally. To be effective, such policy-making will: (a) remain problematic without a coherent view consensus on the role of agrobiodiversity in the overall organisation of agricultural production, and (b) require higher investments in discussing and communicating the relevance of agrobiodiversity with all relevant stakeholders in the agro-food chain.

Keywords: Agrobiodiversity, agro-food chain, on-line stakeholder dialogue, interviews

Introduction

Since the United Nations Conference on Environment and Development (UNCED) in 1992, the loss of biodiversity has become a prominent issue in the debate on environment and rural and agricultural development. The implementation of the Convention on Biological Diversity (CBD), which was one of the visible outcomes of UNCED, encouraged many of the 176 signatory countries to establish new programmes for the conservation and use of biologically diverse resources (hereafter 'biodiversity'). The Netherlands ratified the CBD in 1994. To meet its international obligations a Netherlands Strategic Action Plan Biodiversity (SPA) was implemented in 1995.

The Strategic Plan of Action on Biodiversity (SPA Biodiversity) is an interdepartmental programme of the Ministries of Agriculture, Nature Management and Fisheries (LNV); Housing, Spatial Planning and the Environment (VROM); Foreign Affairs (DGIS); Economic Affairs (EZ); Transport, Public Works and Water Management (V&W); and Education, Culture and Science (OC&W). Scientists, nature conservation and environmental organisations, and the private sector have also contributed to its development. The implementation of the SPA is co-ordinated by LNV and VROM. The SPA provides an institutional basis for policy measures on the conservation and utilisation of biodiversity in nature conservation, the environment, spatial planning, water management, and agricultural production processes.

In line with its long history in agricultural production and plant research, the Dutch government has expressed responsibility for increasing its efforts in the conservation and utilisation of biodiversity that is or may be useful for agricultural production (hereafter 'agrobiodiversity'). From the beginning, the government gave a wide interpretation to its mission. In 1996 Dutch representatives at the World Food Conference in Rome stated that '... the Netherlands Government strongly supports in international context the conservation and availability of agrobiodiversity, not just through the international networks of genebanks (*ex situ*), but also and especially *through the conservation of agricultural systems* (*in situ*).' (emphasis added) (Anonymous, 1996c). The emphasis on agrobiodiversity as an integral element of (sustainable) agricultural production is also reflected in the SPA Biodiversity. Agrobiodiversity will help (a) to create sustainable farming systems as an alternative for the ecological problems caused by the current agricultural production system, (b) to strengthen the Dutch agricultural industry, in particular the national plant and animal breeding industry, and (c) to conserve an important element of biodiversity for future generations (Anonymous, 1996b) (*cf.* Anonymous, 1999b:7).

The Dutch objectives stem from a mix of concerns in the government over global food security and sustainability of agricultural production. Current patterns of agricultural land use are based on a very limited numbers of species and varieties. This situation signifies the diminished overall biological diversity within agricultural ecosystems and is regarded to undermine the long-term sustainability of agricultural production. The problem has global proportions, being apparent in the uniform agricultural production systems in developed countries, as well as in developing countries, with their unsustainable forms of agriculture expanding into forests and marginal lands, and often depending on non-sustainable irrigation. Besides, it is increasingly realised that agrobiodiversity could play a role in developing new crops and crop varieties to meet the growing global demand for food (Anonymous, 1996a:21; Anonymous, 2000).

In spite of governmental attention and growing concerns about the lack of sustainability in agricultural production, the deployment of agrobiodiversity has hardly obtained a niche in national agricultural policy making. Currently, the attention for agrobiodiversity even tends to flaw. This limited political leverage causes problems with integrating the issue in existing policy instruments, such as the upcoming memorandum of understanding on Nature, Forestry and Landscape of the 21st century, NBL21 (interviews IKC-L, VROM). To date, an attempt of a special Biodiversity

Project team of the Ministry of Agriculture (LNV) to bring up the issue of biodiversity in agriculture within ministerial circles, revealed a rather low awareness of the meaning and relevance of the issue (Anonymous, 1999b). Within the Ministry of Agriculture, Nature Management and Fisheries, documents which advocate a more intensive use of agrobiodiversity in agriculture (Anonymous, 1999d) do not influence higher level policy making (interviews IKC-L). Similar statements on the need to promote agrobiodiversity from the Rathenau Instituut, a governmental think-tank on long-term strategic questions, received equally little attention from the political parties.

Government initiatives to create political leverage through agro-food chain wide stakeholder dialogues are initiated but yield little concrete results in terms of political action. Stakeholders which recognise the functional role of agrobiodiversity have seldom been able to generate concrete actions (Anonymous, 1999a; Anonymous, 1999b; Anonymous, 1999e;). Most concrete activities since the adoption of the SPA have been directed towards nature conservation (Romijn *et al.,* 1999). Such phenomenon may be caused by the extremely general nature of analyses and recommendations concerning the utilisation of agrobiodiversity. A quick-scan of both scientific and popular journals learned that the term agrobiodiversity has different meanings in different scientific, political or economic settings.

Communicating agrobiodiversity

Difficulties with translating scientific and political attention for specific items into concrete policy measures is typical for many issues relating to sustainable development, especially in the case of problems that were recognised only recently. De Moor (1998) has defined them as 'wicked problems'. Wicked problems are (a) ill defined, (b) multidisciplinary in kind and difficult to trace in terms of origin, and (c) superficially recognised by many different institutions (Gray, 1997; Moor, 1998:20–22). We may add that wicked problems are relatively simple in terms of conception (e.g. ozone depletion causing global heating, soil erosion causing floods, genetically modified organisms implying health risks) but difficult to translate into concrete action.

The problem resulting from decreased agrobiodiversity can be easily envisaged: less agrobiodiversity causes environmental damage, which in due term, may negatively influence agricultural production itself. The solution to the problem seems equally simple: re-integrating the use of agrobiodiversity in agricultural production may help to restore the balance between agriculture and the natural environment on which it depends. Still, agrobiodiversity is, at least in political terms, a wicked problem. Although the problem may be easily understandable, expert views on the beneficial role of agrobiodiversity in agriculture remain highly divergent depending on the expert's position in or perception of agricultural production issues. Producers at the end of the agro-food chain (processors, retailers) tend to view agrobiodiversity very differently from those at the beginning (plant breeders, farmers). As a consequence, it remains difficult to understand the loss of agrobiodiversity. Evolutionary

mechanisms and human action both play a role, but how they interfere is still debated. Finally and most importantly, while agrobiodiversity is mentioned by many different institutions as an important issue, there is still no visible agrobiodiversity lobby strong enough to generate long-term concerted action. The result is that agrobiodiversity seems everybody's and nobody's problem simultaneously.

Regardless how fruitful the current scientific debate on the usefulness of agrobiodiversity in agriculture may be, this debate has not yet been galvanised by the most relevant stakeholders involved in agricultural production. In order to translate the growing scientific attention for agrobiodiversity into concrete and concerted political action a better insight in the *perception of agrobiodiversity* of most stakeholders involved and their involvement in the debate is required.

Involving a large and varyingly committed group of stakeholders in a countrywide discussion on agrobiodiversity in our view required an unorthodox research methodology. So far, communication between experts on agrobiodiversity traditionally has depended on rather incidental communication, be it 'live' in expert meetings, congresses, or much slower, through publications in the academic discourse. Moreover, the discourse on agrobiodiversity performed a subsidiary role in more vested discourses, such as on biodiversity degradation and global food problems. Both analytically and politically, the issue seemed to remain squeezed between the major issues of nature protection and sustainable agricultural production. In addition, the communication over agrobiodiversity reflected the watershed between stakeholders and experts of 'non-producing' parties (NGOs, governmental officials, and private consultants), and producing parties (farmers, the seed industry, the processing industry, retailers, and consumer organisations). Visions and views developed by the first group on how agrobiodiversity should or could be used have hardly been taken up by the latter. Experts with outspoken views on the use of agrobiodiversity in sustainable agriculture showed difficulties communicating these views to other stakeholders in the agro-food chain. Finally, a lack of 'best practice' experiences contributed to the lack of understanding between parties.

The Centre for Genetic Resources the Netherlands (CGN, Plant Research International, Wageningen) and the Department of Communication and Innovation Studies (CIS, Wageningen University and Research Centre) initiated an on-line stakeholder dialogue (OSD) among 45 participants involved in agricultural production in the Netherlands (see appendix). Participants in the discussion contributed in their personal capacity and did not necessarily reflect the views of their organisations. The dialogue, entitled 'Vision on Agrobiodiversity' [Visie op Agro-biodiversiteit, see: http://www.agrobio.nl/] took place between October 1999 and May 2000, and generated 105 contributions. (Pistorius, 2000)

On-line discussions

The CGN/CIS internet project started off with the assumption that the novelty and complexity of the problem area and the heterogeneity of the stakeholder groups involved, demanded a rapid, interactive and intensive communication. It was our as-

sumption that the Internet would meet these requirements to a large degree, although not fully. By initiating an OSD on agrobiodiversity, the project team decided to take a calculated risk. Scientific analyses of computer-mediated communication on complex issues are only in a pioneering phase (Fernback & Thompson, 1995; Jones & Rafaeli, 1999; Moor, 1999). However, recent research also indicated several important advantages of OSDs over more traditional forms of stakeholder dialogues (Crasborn, 1997; Dubrovsky *et al.,* 1991; Hanssen *et al.,* 1998; Leeuwis, 1999a; Leeuwis, 1999b; Leeuwis *et al.,*1997; Rheingold, 2000; Sudweeks & Rafaeli, 1996). These perceived advantages are detailed below.

In terms of quality of the discussion: OSDs can enhance a cumulative, co-operative learning process. Accumulated information can easily be downloaded or hyperlinked to the main website. Also, it is relatively easy to maintain a large number of discussion-lines simultaneously. Participants in successful OSDs have the potential of becoming a truly interactive 'learning community', the discussion partners being the 'co-producers' of an interactive learning process (van Druten 1999). The option to involve interested individuals or experts as non-participating 'spectators', or to install expert panels on specific issues, may further enhance the quality of the input and the dynamics of the discussion.

In terms of transparency: OSDs usually increase the transparency of the discussion. Arguments and counter-arguments can be clearly visualised, structured and traced back by the moderator and participant. The transparency is further enhanced by the possibility to create direct on-line access to participants' e-mail addresses or to allow participants to edit each other's contributions. Finally, advances in bulletin board software increasingly allows for a clear mapping of multiple discussion-lines which facilitates both the formulation and active use of conclusions.

In terms of participation: Conventional debates require high investments in co-ordination and mobility whereas participants of OSDs have the opportunity to react at any time and from practically any PC. OSDs also allow for a more egalitarian participation: less well-informed, or less assertive participants can improve the quality of their input, and are less influenced by the social positions of others.

The assumption that OSDs are promising tools to tackle wicked problems does not only depend on the advantages of computer-mediated communication. The fact that Internet has become a primary vehicle for information transfer and knowledge building makes it attractive to involve this medium in professional debates of a more structural and long-term nature addressing many stakeholders. The growing speed of Internet search engines to promptly screen a very large amount of information on specific issues such as 'agrobiodiversity' also allows new research and discussion approaches. With so much information and views ready at hand it is no longer unavoidable to initiate discussions on the basis of single, static views. But apart from the advantages of the Internet as a continuously updated source provider, 'the web' is also changing the way in which professional discussions are held.

All stakeholders involved in Vision on Agrobiodiversity were connected through an Internet-platform. A special web-site was designed to facilitate six discussion rounds on an equal number of themes: (1) The definition of agrobiodiversity (2) The importance of indicating a primary problem owner or 'change agent' in the use and conservation of agrobiodiversity, (3) The impact of plant breeders' rights on agrobiodiversity (4) The impact of modern plant breeding on agrobiodiversity, (5) The impact of consumer behavior on the sales of agrobiodiverse products, and (6) The role of the national government in setting out long-term strategies to conserve and use agrobiodiversity. An essay on the problem area and a set of related statements introduced each theme. The results of the discussions are summarised below, both at the contents and the process level.

Defining agrobiodiversity

According to the CBD, agricultural biodiversity includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agro-ecosystem (see: CBD annex I of decision III/11 in Anonymous, 1992). In addition, several levels of biodiversity were recognised, i.e. genetic diversity within species, diversity between species and diversity at the agro-ecosystem level, to which the scope described above specifically relates. Such broad definition appears unfit for translation into concrete policy measures. Countries implementing the CBD therefore usually qualify the scope of the definition. According to a Dutch expert working group, agrobiodiversity includes the following elements: (a) domesticated species, (b) species with a 'life support function' (such as soil organisms and micro-organisms), and (c) other organisms which have no direct role in agricultural production but are part of the agro-ecosystem (such as pasture birds, insects, and characteristic elements of agricultural landscapes) (Anonymous, 1999a; Anonymous, 1999b).

The on-line discussion revealed that the scope of this latter definition was less well defined than the formal definition. Participants affiliated to the plant breeding industry adopted a rather narrow and pragmatic interpretation of the definition. They considered an increase of genetic diversity between crop varieties as a prime vehicle to increase agrobiodiversity. Since genetic variation forms an element of agrobiodiversity, new agrobiodiversity would be produced through each new combination of plant genetic characteristics. This interpretation had direct implications for the way in which the problem area was perceived. New initiatives to conserve agrobiodiversity should predominantly help to overcome the weaknesses of economically important crop plants and current agro-ecosystems. *Ex situ* conservation strategies were considered the most effective way to achieve this end (contributions to the OSD 'Vision on Agrobiodiversity'; interviews AB-DLO, Nunhems Zaden, GistBrocades).

NGOs and more critical scientists from an agricultural or ecological background maintained a broader interpretation of agrobiodiversity. Genetic diversity within and between crops was considered important, but the focus shifted to the interaction between all four biological elements of agrobiodiversity. Contrary to the participants

from the plant breeding industry, these groups considered the political area represented by agrobiodiversity more important than the exact definition of the term. Rather than as a set of biological categories the social construction of the term agrobiodiversity was perceived to help generate political pressure to value this natural resource as an integral element of sustainable agricultural production. As such, agrobiodiversity has gradually become a new element in their overall lobby for a more balanced interaction between agricultural production and the natural environment (contributions AKB, Platform Biologica, Greenpeace, Milieudefensie).

Participants from the wholesale and retailing industry gave a third and entirely different interpretation of the term agrobiodiversity. They interpreted agrobiodiversity as the diversity at the level of finished products, and thus diverted far from the formal definition of agrobiodiversity (contributions the Greenery, Laurus). Nevertheless, a better understanding of the value of agrobiodiversity by this group of stakeholders could in principle have a major impact on consumer behaviour, a statement outlined below in greater detail.

The term agrobiodiversity was originally defined in exact terms but broadly interpreted, depending on the person's or organisation's role in agricultural production. The interpretation of agrobiodiversity 'changed colour' depending on the interests of each stakeholder group in its conservation and use. We noticed as a conclusion from the first discussion round that producers at the end of the agro-food chain (processors or retailers) tended to view agrobiodiversity differently from those at the beginning (plant breeders or farmers), and direct producers held different views than indirect stakeholders.

In search of a 'change agent'

Formulating policies on agrobiodiversity has caused problems regarding the identification and mobilisation of a prime responsible actor or 'change agent'. This absence of an obvious agricultural change agent is rather unique in Dutch agricultural history. Until the 1980s, the Ministries of Agriculture, Nature Management and Fisheries, and of Economic Affairs – closely interacting with powerful farmer lobby groups – remained the main architects of the Dutch agricultural production system. However, since then active interference with practically all aspects of agricultural production has been gradually replaced by a selective encouragement of best practices (Anonymous, 1999f). The retreat of the government as a steering agent in the organisation of agricultural production has raised questions about responsibilities for the future use and conservation of agrobiodiversity. This problem formed the starting point of the second discussion round.

NGOs and critical scientists held the view that a more active use and conservation of agrobiodiversity would necessarily imply profound changes in the organisation of agriculture. To this end, drastic governmental involvement in agricultural production was regarded paramount and urgent (contributions and interviews AKB, CGN, Greenpeace, Milieudefensie, Platform Biologica, TAO, Rathenau Instituut). It was argued that actual agricultural practice has pushed the Dutch agro-ecosystems to the

limits of their carrying capacity and has caused a alienation between farmers and the fate of their products in the production chain. Governmental action should not only promote more sustainable, local food production strategies, but also actively discourage agricultural practices that were seen to contribute to unsustainable production. Various strategies to engage the collaboration of the private sector were distinguished, government and private sector regarded as allies or as stakeholders representing differing interests.

Discussants representing the private industry indicated that the dominant agro-economic regime offered plenty of opportunities to foster the conservation and use of agrobiodiversity. In this view most concrete action could be expected from the seed industry, food-processing industry, wholesale and retail industry. They should take advantage of challenges created by stricter environmental regulations and the growing consumer awareness on food. The role of the government should remain supportive, particular in areas where the private industry would be unable to pay for development costs of new research and development avenues (contributions and interviews Advanta; Novartis; RijkZwaan).

Other discussants reflecting on the prime change agent regarding the future use and conservation of agrobiodiversity suggested that there was no change agent required at all or, the reverse, that the entire agro-food chain should act as such. This apparent inability to reach consensus on a change agent may reflect two problems in the communication over agrobiodiversity, representing intrinsic fallacies of macro-analyses on broad problem areas such as agrobiodiversity. Picturing a single actor as responsible for the predetermined process (in this case an unsustainable agro-food chain) can discourage even the most responsible individuals to indicate a responsible changing agent. An exception to the rule was the view of the Centre for Agriculture and Environment, a private consultancy that advises the Ministry of LNV on agrobiodiversity. CLM stressed the importance of governmental and private industry involvement but clearly identified front-runner farmers as the prime change agents (interview CLM; Anonymous, 1999e:i-iv). The second fallacy refers to the inability to connect the issue of change agent to a preference for a particular organisation of agricultural production. This problem formed the subject of the third and fourth discussion rounds and is discussed below in greater detail.

Agrobiodiversity and plant breeding

The Dutch plant breeding industry is one of the largest in the world and the third largest exporter of seed (Heijbroek *et al.,* 1996). At the same time, the Netherlands, as many other industrialised countries, is poor in native wild relatives of crop plants whereas farmers' varieties have vanished long ago from farm fields. Due to increasingly strict regulations on pest and insect control, growing interest in sustainable production and the prosperous economic tide, a niche market is emerging for less input dependent varieties, in the form of organic, regional or traditional products. The question at stake at the third discussion round was whether these circumstances provided for new scientific, political and economic arguments to increase the activities

of the plant breeding industry in producing more agrobiodiverse crop varieties in response to this development.

NGOs, knowledge institutions, the public plant breeding sector and the Dutch genetic resources programme answer this question with a clear yes. They stressed the problem of an accelerating decrease of genetic diversity within and between crops. In this view, the loss of genetic diversity (both inter- and intra-specific) was considered closely connected to (a) the gradual decrease of region-specific cropping systems and (b) the transnationalisation of the plant breeding industry producing fewer genetically homogeneous and similar varieties. The discussion revealed the overriding importance of utilising wild relatives and farmers' varieties in breeding programmes aiming at an overall diversification of the Dutch agricultural sector (contributions AB-DLO, CGN, IKC-L, PRI; contributions and interviews CLM, ETC, Rathenau Instituut, TAO) (Lammerts van Bueren, 1994 and 1999; Visser *et al.,* 1997; Anonymous, 1998b).

Participants from the private plant breeding industry tended to interpret the level of agrobiodiversity in terms of the level of genetic variation in new varieties. They were concerned about the common, economically sound practice of the private industry to rely extensively on the limited genetic variety of commercially successful varieties, but argued that heavy competition on the seed market left no room for varieties with a sub-optimal yield performance or with unconventional genetic characteristics such as a different leaf colour, or taste nor for (pre-competitive) research into base broadening of crop genetic backgrounds (contributions and interviews Advanta, Novartis, Nunhems, RijkZwaan). The emerging demands for organic food were recognised as a window of opportunity, but the expansion of the organic seed market was seen to depend on a stringent implementation of governmental regulations on the use of agrochemical inputs (notably the Tweede fase Meerjarenplan Gewasbescherming). It was regretted that the implementation of this regulation had hardly materialised. Without more stringent regulations price levels for agro-chemicals were expected to remain too low to trigger more R&D on low-input varieties (contributions and interviews Advanta, Novartis, Nunhems Zaden, RijkZwaan, IPO) (Anonymous, 1998a).

This discussion round remained inconclusive regarding the impact of intellectual property rights, notably Plant Breeders Rights (PBR), on new varieties with a broader genetic base. It was agreed that in principle, the PBR criteria of Distinctiveness, Uniformity and Stability (D.U.S.) would be difficult to apply to more heterogeneous varieties better adapted to lower-input agro-ecological circumstances. Loosening these criteria might facilitate the emergence of an organic seed market (contribution PRI), although the Dutch Seed Trade Association (contribution NVZP) pointed out that such would violate the current rights of the producers of registered varieties.

Consuming agrobiodiversity

Growing consumer concerns over the quality and origin of food and food production

processes have helped consumer organisations to enforce minimum quality standard and certification schemes. In particular, discussions on the perceived environmental and health risks attached to genetically modified food products have triggered consumer organisations to pay more attention to this area and formulate demands. The question at stake in the fourth discussion round was if this bargaining power could be mobilised to promote the food processing, wholesale and retail industry to increase the marketing of agrobiodiverse food products.

This discussion round started with revisiting the precise meaning of agrobiodiversity 'on the shelf'. Two main discussion items could be identified. The first concerned the diversity among finished products. This 'product-diversity' triggered reactions varying from a true disgust from the overload of unnecessary food items, to mild critics on the *mimic diversity* in day-to-day food packages (contributions and interviews AB-DLO, AKB, CGN, GistBrocades, PRI, NVZP, Rathenau Instituut). It was agreed that an increase of product diversity did not necessarily contribute to agrobiodiversity (contributions CGN, GistBrocades, NVZP, PRI). Instead, true agrobiodiverse food items should be characterised by distinctive qualities such as a traceable region-specificity, a better taste, and a smaller 'ecological foot print'. These qualities might nevertheless result in food products that are the result of agrobiodiverse production systems but are as such invisible for consumers. In this case a change of consumer behaviour would depend predominantly on additional information such as new 'agrobiodiversity' label- and certification schemes (contrib. AKB, Ecooperation, Milieudefensie, TAO, W-UR).

Changes in consumer behaviour were regarded as not only in the hands of consumers. The presentation of and information about the intrinsic qualities of food is increasingly influenced by internationally operating food processing companies and supermarket chains. To date, most European supermarket chains are owned by 10 holding companies. Production advisors of these companies set increasingly global standards for subcontracting food processors, farmers and even seed companies. The resulting standardisation process might on the one hand have a devastating impact on agrobiodiversity. On the other hand it appeared that especially these larger companies form a comparatively fertile ground for socially responsible and environmentally conscious business practices.

The discussion on this development remained inconclusive, but did reveal that the Euro-Retailer Produce Working Group (EUREP), consisting of 15 large European supermarket chains, had recently developed criteria that may have a positive impact on agrobiodiversity. These criteria, referred to as GAP (Good Agricultural Practice), should help to maintain consumer trust in food quality and safety, decrease the use of agro-chemicals, increase social responsibility as regards the safety and health of employees, and minimise the negative impact of agriculture on the environment. But although GAP refers to the 'protection of biodiversity', it is not explicit on how such policies would translate in more agrobiodiverse food items. Participants from a large Dutch supermarket chain (contribution Laurus) and a wholesale company (contribution the Greenery) appeared convinced that agrobiodiversity as an additional, rather complex, sales argument held future potential but for the moment would cause confusion on the still fragile market for organic food products.

Lessons learnt on communicating agrobiodiversity

Did this OSD yield the expected advantages over more traditional forms of stakeholder dialogues? On the basis of the previously defined criteria of quality, transparency and participation, we briefly summarise our main impressions.

In terms of quality: If we focus on the amount of interactions between the participants, this OSD scores rather low. Of the 105 contributions only 34 were in reaction to contributions of other discussants. But although most participants confined their answers to a reaction on the introductory statements of the moderator, the quality of the individual contributions was relatively high in terms of the level of detail, knowledge of the subject, and relevance to the ongoing discussion. The OSD also revealed that the quality of the contributions to the discussions to a large extent depended on the active involvement of the moderator.

In terms of transparency: The OSD scored high on transparency. Decisive was the simple lay-out of the website, and the easy access and structure of the bulletin-board. The bulletin board offered an instant overview of the individual contributions, both chronologically and in terms of subject of the contributions. The easy access motivated some participants, but also contributed to what may be dubbed as 'virtual agoraphobia'. OSD-discussants generally had more time to formulate carefully than they would have in live discussions, but were careful to react on each others contributions. The fact that internet still depends on written statements which are less easy to adapt and correct than spoken ones seem to form an important reason.

In terms of participation: Of the 45 discussants, 30 became actively involved in the discussion. About 15 persons contributed frequently. Most active contributors were the staff of the public and private plant breeding industry. Given the complexity of the subject and voluntary status of this OSD, the total amount of 105 contributions can be regarded as an acceptable result. Off-the-record comments by participants revealed that both the introductory essays to each theme and the contributions of other participants were frequently read. Hence, the number of 'log-ins' to the web page may have been much higher than the visible contributions suggest. Unfortunately, no figures on the number of visits have been obtained. Off-the-record comments also suggested that the ease by which others could make comments through the bulletin board made some discussants hesitant to contribute. Discouraging also was the absence of face-to-face contact. The fact that a majority of the discussants had never met personally created a threshold for some. Indeed, the success of traditional professional debates often partly depends on informal social habits, which establish or strengthen group identity, such as corridor chat, eating, drinking and walking.

Based on the experiences in this project, we have concluded that OSDs offer advantages as well as disadvantages in promoting opinion making and the formulation of new policies on agrobiodiversity or comparable 'wicked problems'. Some of these advantages may make an OSD an attractive alternative or complementary approach

compared to more traditional forms of communication over equally complex issues. These are (a) the continuous access to a transparent overview of major opinions on the issue, (b) the ability to offer and receive quick feedback, (c) the possibility to generate and document a considerable amount of comments from a heterogeneous group of discussants. A deciding factor in the success of an OSD is the quality of the moderatorship. This OSD indicated that a moderator has to be available who can act as the host of the virtual community grouped around the website *and* motor of discussion. Moderatorship required a substantial amount of time and inputs. In addition to hosting the website proper, the moderator had to physically meet with a considerable number of individual participants to inspire them to contribute to the debate.

Agrobiodiversity and the organisation of agricultural production

This OSD leaves the impression that although most discussants have a general understanding of the importance of the subject, there is little experience in how to translate individual concerns and perspectives into concrete actions. Several obvious explanations for this lack of implementation modes have been suggested so far, including the relatively recent political attention for the subject, the multi-disciplinary and complex nature of the issue, the broad and non-uniform definition of the term, and a lack of apparent 'change agents'. Here we argue that in addition to these explanations the deeper lying reason for this dead-lock may lie in the inability of most stakeholders during the discussion rounds to link the issue of conserving and utilizing agrobiodiversity to a preference for a particular organisation of agricultural production.

Discussions on the use and conservation of agrobiodiversity are usually held within diverging social, economic and intellectual environments. This OSD on agrobiodiversity suggested that hence it is difficult to discuss agrobiodiversity within a single constituency, resulting from different paradigms and views held on how agricultural production should relate to its ecological environment. Participants from NGOs deemed the impact of current political initiatives to promote the conservation and use of agrobiodiversity negligible as long as the entire production chain is not challenged and reorganised (interviews AKB, Milieudefensie, Greenpeace). Others discussants, such as those representing the private sector (contributions and interviews Advanta, Novartis, Nunhems, RijkZwaan) held that market incentives alone may not form the prime incentive to increase the use of agrobiodiversity, and referred to mild forms of regulation which do not challenge the organisation of the Dutch agricultural production system as such. Participants from the Ministries of Environment and Agriculture and associated knowledge institutions were inclined to think in terms of a gradual restructuring of the contemporary production system to the advantage of agrobiodiversity through a balanced combination of market incentives and regulatory measures. The difference however with the private sector is the level.

These diverging positions on strategies to support the conservation and use of agrobiodiversity reflect different perceptions of how agriculture should be organised. We therefore attempted to synthesise these contending perceptions surfacing

during the on-line discussion into three *archetypal rival agricultural production strategies*, each implying a different strategy on the use and the conservation of agrobiodiversity. The differences between the three production strategies have been accentuated in our description below for reasons of clarification, realising that various participants in the OSD and indeed stakeholders in general have adopted these models to a varying degree. Distinguished here are a sustainable/local strategy, a market-led/transnational strategy, and a state-oriented/national strategy.

Perceptions on agrobiodiversity in three rival agricultural production strategies

1) *The sustainable strategy:* In developing countries, this strategy is concerned with a non-industrialised, farmer-oriented and product-oriented agriculture. It focuses on the maintenance and improvement of relatively small-scale farming systems, and is in support of farmers who have been marginalised during the process of agro-industrialization. The strategy aims at a higher level of autonomy of these farming systems by reducing dependence on the use of external, industrial inputs. Crop development should focus on local needs and tastes, and should be based on indigenous crops and other locally available natural resources. New varieties can be characterised by a wide field resistance and adaptability. Production focuses on quality instead of quantity. Products marketed outside the area of production rely on quality claims such as better taste, health, environmental friendliness and regional origin. Because nature is considered an integral element of agriculture, agrobiodiversity is viewed as the basis and prime motor of agricultural production. Full utilisation of agrobiodiversity involves the conscious and careful exploitation of natural resistances to pests and diseases and allows avoiding the use of agro-chemicals. Farmers save on their expenses for agro-chemicals, whereas region-specific products and short production chains may help to restore the disrupted link between producer and consumer. In industrialised countries, a distinction between local sustainable farming practices and more industrialised, export oriented practices can be made. The latter type of industry attempts to strike a balance between the quality/health claims and the economic advantages of bulk production.

2) *The market-led/transnational strategy:* This strategy presupposes an on-going market-led industrialization of agriculture, accompanied by a transformation of nature-dependent and farm-based processes into technology-managed and industrial processes at a pace and along lines set by the market. The government plays a facilitating role in speeding up the transformation process to allow effective international competition. It should limit its interference to setting general aims at the functions of rural areas and the conditions for agricultural production, and leave new developments to private initiatives. The strategy is global in its orientation. The world is perceived as one global agro-food enterprise in which production and distribution are effectively organised through the market. To this end, the agricultural sectors of the individual countries should specialise and compete on the basis of their comparative advantages (e.g. climate, labour costs, technical expertise, logistic conditions), while

Table 1. Perceptions on agrobiodiversity in three rival agricultural production strategies.

Production strategy	*Market-strategy*	*Conservation-strategy*	*Mode of conservation*	*Perception of nature*	*Perception of agrobiodiversity*
Sustainable/local	Diversification	Integrated in local production system	In situ / ex situ	Nature is basis of cultural, social and economic wealth	Oriented towards inter- and intra-specific diversity and the interaction between agricultural production and natural surrounding
Market-led/ transnational	High degree of specialisation	International division of labour in conservation	Ex situ	Protection through selective protective measures and advanced technology	Oriented towards intra-specific diversity to secure genetic characteristics in commercial crop plants
State-regulated/ national	Limited specialisation	Conservation for long-term national food and income security	Ex situ / in situ	Nature exploited on the basis of national political agenda	Orientation towards intra- and inter-specific diversity to secure long-term interests of national plant breeding industry

After Pistorius & Van Wijk, 1999.

agricultural trade should be unhindered by prescriptive national regulatory interference. Industrial food processing is regarded as a major trend offering options to diversify food supply and setting requirements to the farm product.

National crop development should be based on all the germplasm and scientific information internationally available. It should focus on the improvement of productivity and quality of those crops that can be produced nationally against internationally competitive prices. Investments in the production of crops that can be imported at lower costs should be avoided. Little attention is yet paid to the reduction of crop rotations and the consequences for the sustainability of production. The interest in agrobiodiversity is mostly oriented towards intra-specific, genetic diversity to secure high yields of uniform crops. Proponents of the market-oriented strategy consider *ex situ* conservation of genetic diversity sufficient to mitigate an inevitable degradation of agrobiodiversity.

3) *The state-regulated/national strategy:* This strategy favours a government-controlled industrialization of agriculture and implies a focus on wider functions of rural areas and a prominent role of the national state in the organisation of agricultural production. Government involvement is led by the national political agenda, in which a broad variety of national producer and consumer interests are taken into account. The steering role of the government may take two directions. On the one hand, some developments in agro-industrialization may be slowed down in order to avoid social costs, such as the too rapid elimination of medium size and small farms, the risk of a further decrease of income in the agricultural sector, or to accommodate for concerns about health aspects linked to the production of genetically modified food. On the other hand, governments may encourage politically desirable industrial developments by funding agricultural research, offering tax benefits, etc. In general, this strategy supposes that the state plays an active role, not only in agricultural production, but also in balancing the use of rural areas for the production function with other uses such as nature conservation and recreation. In the state-led strategy, crop development is focused on raising the productivity and quality of those crops that are considered to be important for national farmers and consumers. Internationally available and nationally accepted technology is utilized to this end. The ecosystem is valued as a source of economic development, which should be exploited according to the national political agenda. Proponents of the state-regulated production strategy have a broad view on the conservation and use of agrobiodiversity in order to accommodate the interests in agrobiodiversity of many different stakeholders varying from transnational corporations to local organic farmers.

The three descriptions above refer to archetypes of agricultural production strategies. This implies that interest groups (government, private sector, NGOs, knowledge institutes etc.) will in practice opt for a simultaneous or subsequent combination of these strategies and their respective elements. This 'strategy-mixing' was also apparent from the contributions of the discussants in the OSD, although various participants exhibited this to a different degree. Some interest groups, notably the knowledge institutes, such as CLM, TAO and most NGOs are fairly consistent in

linking a preferred agricultural production strategy to a preferred agrobiodiversity conservation and use strategy. Their vision on the conservation and use of agrobiodiversity comes close to the description of the sustainable/local agricultural production strategy. Obviously, their position as external actors in the agro-industry allows them to make few compromises in their overall vision on agriculture and environmental protection. The generally straightforward vision on the necessity to integrate agrobiodiversity in agricultural production is, however, difficult to translate into concrete business strategies. Proactive strategies to bridge the gap between producing parties and knowledge institutes have hardly been materialised.

The breeding industry is depending on market incentives to increase its use of agrobiodiversity but is hardly successful in doing so. Being well aware of the environmental costs of the dominant market-oriented production strategy, the agro-industry is in principle willing to explore the new market niches for more environmental friendly, potentially agrobiodiverse, crop varieties, in the hope that this might also render them an international advantage. However, the market for these varieties remains very small. Only one small commercial seed company, Vitalis Biologische Zaden, is able to depend entirely on organic seed sales, although most is exported to France and Germany (interview Vitalis). The modest size of the Dutch organic seed business is further illustrated by the import of French wheat varieties by a Co-operation of ecological wheat farmers in the province of Zeeland ('Zeeuwse Vlegel'). Recently, more seed companies seem to have recognised the future market potential of the organic sector and are considering or have indeed decided to propagate varieties suitable for organic production.

In addition to the propagation of varieties for the organic sector, the growing reliance on biological or integrated pest control can be regarded as an increased utilisation of agrobiodiversity. This development has been strongly influenced by government regulations banning or restricting the use of certain chemical compounds. The often small producers of biological control agents do not seem to play a role in the debate about an increasing reliance on agrobiodiversity, whereas the international agro-industry, including the breeding companies have yet little stakes in this development. The absence of the biological pest control producers from the debate is reflected in the OSD described here. In future initiatives, a more direct link between the conservation and utilisation of genetic resources and the use of integrated pest and disease control programmes as part of the utilisation of agrobiodiversity needs closer attention.

Research and development of new organic varieties requires both new investments but most of all new alliances between mainstream seed companies and other stakeholders. The terms of agreement between the Louis Bolk Institute (Driebergen, the Netherlands) and Advanta Seeds certainly falls into this category. This joint initiative is to support the development of organic varieties on the basis of unfinished breeding lines with a larger than average field resistance supplied by Advanta (interview Advanta). At this point, increased attention of the government for agrobiodiversity has resulted in the inception of a new Agrobiodiversity research programme. In this programme the interactions of the various components of the agro-production systems and the ways these interactions impact on agrobiodiversity in these systems are studied

in order to allow for future agrobiodiversity policies of the government. In addition, the government has recently funded a breeding programme for the organic sector, increasing existing public research efforts in the improvement of organic production.

Actors deeper involved in the overall organisation of agricultural production, notably government officers and the plant breeding industry, are most ambiguous in their choice for a particular agricultural production strategy. The Dutch government, due to its broad mandate and role of mediator between different interest groups – each lobbying for a different production strategy – maintains a diffuse set of parameters for the future role of agrobiodiversity in agriculture. It seems as if all three strategies are followed at the same time. Market incentives (following strategy 2) are supported by governmental regulations (strategy 3) to encourage sustainable agricultural development (scenario 1) (Anonymous, 1996a:21; Anonymous, 1999c; Anonymous, 1999f). The viability of this approach can be questioned given the vast restructuring process of the Dutch agricultural production system in which the issues of how agriculture is organised is increasingly left to the market forces (Anonymous, 1996b; Anonymous, 1999f). If an increased use of agrobiodiversity is recognised as a viable option for future sustainable agricultural production, more rigorous supportive measures are deemed necessary.

Conclusions

Agrobiodiversity is a complex issue and its notion is difficult to communicate. Still, the development of skills to communicate on agrobiodiversity is paramount as it represents an important key to achieve a more sustainable Dutch agricultural production. Future investments in the debate on agrobiodiversity should (a) enhance a chain-wide communication on the subject, involving all major stakeholders, and (b) place the issue in its relevant macro-economic setting, i.e. the overall organisation of agricultural production.

(ad a) Communication on agrobiodiversity depends on the ability to generate transparent and targeted discussions involving all major parties in the agro-food chain. Internet may well play a role in increasing both the quality and quantity of the communication. This OSD has indicated that computer-mediated communication about agrobiodiversity may add to the quality, transparency, and participation of the discussion, although with clear limitations concerning social networking. But there are more requirements to be met before a successful dialogue can take place. 'Production chain wide' discussions between the relevant stakeholders on agrobiodiversity will only be functional provided these:

- are based on a clear definition of the problem area: what type of agrobiodiversity is under discussion?
- indicate 'change agents': who will take the lead in increasing the use of agrobiodiversity: the government, industry, or NGOs ?
- involve a broad but motivated group of stakeholders: are the discussants also willing to change their views and behaviour, or do they only want to remain informed?

- are clearly embedded in an overall agricultural production strategy: how does the use of agrobiodiversity fit broader targets in the organisation of agricultural production?

(ad b) This OSD started off with a discussion on the different perceptions of agrobiodiversity and ended with one on the role of agrobiodiversity in three archetype agricultural production strategies (sustainable/local, market-led/transnational, state-regulated/national). The interviews and contributions indicated that even the most personal perception of agrobiodiversity hinges on an implicit or explicit concept of how agriculture is (or should be) organised, and which actor should take the lead in realising the desired changes. Most stakeholder discussions on agrobiodiversity implicitly refer to a certain ideal production strategy and the major actors therein, but never take it as a starting point of the discussion. If this requirement is not met, the debate on agrobiodiversity will remain a highly theoretical and marginally effective academic discourse.

A more intensive use of agrobiodiversity needs commitment of all major stakeholders. Concerted action of major stakeholders will remain dependent on a core group of change agents that are willing to consider agrobiodiversity as an integral element of agricultural production. Who are the most obvious change agents? Current changes in the overall organisation of agricultural production imply that farmers are less and less able to organise their own agricultural production. Historically low agricultural prices, a lack of contact with consumers, excessive regulation of almost any element of agricultural production, and a high dependence on agricultural inputs, all seriously handicap the ambitions of many farmers to explore agrobiodiversity. Farmers should be supported where they attempt to increase their role, but their initiatives will fail if very powerful actors at the end of the production chain do not co-operate. The real end-users are consumers. If consumer *perception* of the *potential* health risks of food products (e.g. BSE, dioxin, contamination, GMOs) can influence the marketing strategies of large food processors and retailers , then an equally strong consumer perception of the advantages of agrobiodiverse food may have the result to promote its utilisation.

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Appendix A. Interviewees and discussants.

Abbreviation	Organisation	Representative(s)	Type or organisation
CGN	Centre for Genetic Resources the Netherlands	C. Almekinders J. Hardon T. van Hintum L. van Soest B. Visser	Genebank
Dijkhuis	on personal title	J.P. Dijkhuis	Farmer
Zeeuwse Vlegel	Zeeuwse Vlegel	J. Koeman	Farmers' organisation
LTO	Dutch Federation of Agricultural Producers	J.W. Straatsma	
IPO-DLO	Instituut voor Plantenziekte-kundig Onderzoek	E. den Belder H. Bonthuis	Public plant breeding industry
PRI	Plant Research International	N. Louwaars	
AB-DLO	Research Institute for Agrobiology and Soil Fertility	P. Vereijken	
	on personal title	J.C. Zadoks	
Novartis	Novartis Seeds BV – the Netherlands	P. Boorsma	Private plant breeding industry
Nunhems	Nunhems Zaden BV	O. de Ponti	
IPTS	Int. PlantTechnology Services	B. Hennipman	
RijkZwaan	RijkZwaan BV	K. Reinink	
Vitalis	Vitalis Biologische Zaden	J. Velema	
NVZP	Dutch Seed Trade Association	N. van den Bergh	
Advanta	Advanta Seeds	C. Noome	
GistBrocades	DSM-Gist Brocades	H. van Dam	Food processing
Unilever	Unilever BV, the Netherlands	Ch. Dutilh	
Consun	Cosun-Sensus	A. de Laat	
Laurus	Laurus	E. Gies	Retail and distribution
Greenery	The Greenery	A. van der Linden	
AKB	Alternatieve Konsumenten Bond	N. Brouwer	Consumer organisation
LNV	Ministry of Agriculture, Nature Management and Fisheries	H. van de Baan	Government
VROM	Ministry of Housing, Spatial Planning and the Environment	A. Eijs	
IKC-L	Knowledge and Expertise Centre of the Ministry of Agriculture	P. van Ham	
KIT	Royal Tropical Institute	W. de Boef	Public knowledge centres
W-UR	Wageningen University and Research Centre	R. van Haarlem	
TAO	Department of Technology and Agricultural Development, W-UR	J. Jongerden	
TU	Twente University studycentre for Science, Technology and Society	H. Wiskerke	
Rathenau Instituut	Rathenau Instituut	L. Sterrenberg	

Abbreviation	Organisation	Representative(s)	Type or organisation
SME	SME – Environmental advisors	H. van Nispen	Consultancy bureaus
Ecooperation	Ecooperation	J. Bourjaily C. Enthoven	
CLM	Centre for Agriculture and Environment	A. Guldemond N. Oerlemans	
ETC	ETC Ecoculture	H. Kieft	
Milieudefensie	Vereniging Milieudefensie (Friends of the Earth)	M. Fleur	Ngo's
Biologica	Platform Biologica	L. Luttikholt	
Greenpeace	Greenpeace International	M. van Gool	
Rabobank	Rabobank Netherlands	B. Taverne	Financial institutions
Triodos Bank	Triodos Bank	W. Meijers	